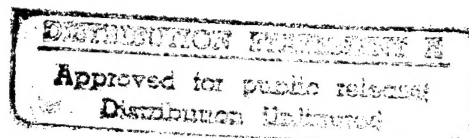


FEBRUARY 1996

REPORT NO. 96-15

PA103 CONTAINER PALLET MIL-STD-1660 TESTS



19960723 043

Prepared for:
U.S. Army Armament Research, Development
and Engineering Center
ATTN: AMSTA-AR-ESK
Rock Island, IL 61299-7300

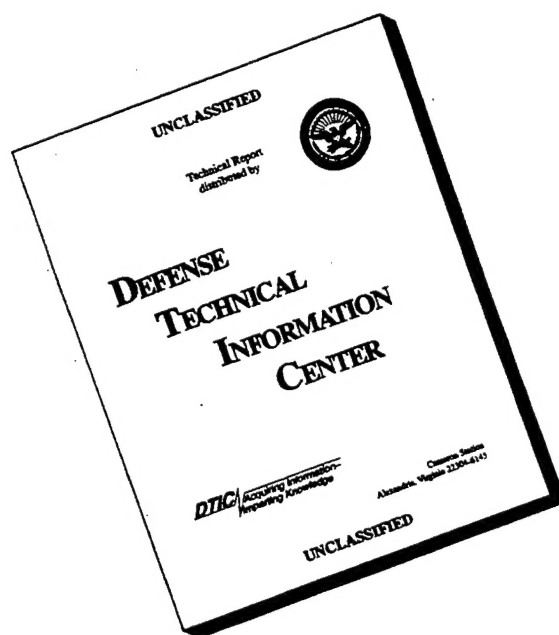
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<p>The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SIOAC-DEV), was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct MIL-STD-1660 tests on PA103 containers unitized on a pallet with dunnage assemblies supplied by Olin Ordnance. This report contains test results with the palletized unit load tested failing to meet MIL-STD-1660, Design Criteria for Ammunition Unit Loads, requirements. Further testing of additional samples is required to determine whether representative pallet and dunnage assemblies meet all performance criteria.</p>					
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22a. NAME OF RESPONSIBLE INDIVIDUAL JEROME H. KROHN			22b. TELEPHONE (Include Area Code) 815-273-8929		22c. OFFICE SYMBOL SIOAC-DEV

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
VALIDATION ENGINEERING DIVISION
SAVANNA, IL 61074-9639

REPORT NO. 96-15

PA103 CONTAINER PALLET MIL-STD-1660 TESTS

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PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SIOAC-DEV), was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct MIL-STD-1660 tests on the PA103 containers unitized on a pallet with dunnage assemblies supplied by Olin Ordnance.

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL.

C. OBJECTIVE. The objective of this test was to ascertain that the palletized unit load meets MIL-STD-1660, Design Criteria for Ammunition Unit Loads, requirements.

D. CONCLUSION. The palletized unit assembly tested failed to meet MIL-STD-1660 requirements. The top dunnage assembly suffered structural damage and the dunnage assemblies did not sufficiently restrict movement of the containers. Further testing of additional samples is required to determine whether representative pallet and dunnage assemblies supplied by Olin Ordnance adequately meet all performance criteria.

PART 2
13 DECEMBER 1995

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PART 3

TEST PROCEDURES

The test procedures outlined in this section were extracted from MIL-STD-1660, Design Criteria for Ammunition Unit Loads, 8 April 1977. This standard identifies nine steps that a unitized load must undergo if it is to be considered acceptable. The four tests that were conducted on the test pallets are summarized below.

A. STACKING TESTS. The unit load was loaded to simulate a stack of identical unit loads stacked 16 feet high, for a period of one hour. This stacking load was simulated by subjecting the unit load to a compression weight equal to an equivalent 16-foot stacking height. The compression load was calculated in the following manner. The unit load weight was divided by the unit load height in inches and multiplied by 192. The resulting number was the equivalent compressive force of a 16-foot-high load.

B. REPETITIVE SHOCK TEST. The repetitive shock test was conducted IAW Method 5019, Federal Standard 101. The test procedure is as follows: The test specimen was placed on, but not fastened to, the platform. With the specimen in one position, the platform was vibrated at 1/2-inch amplitude (1-inch double amplitude) starting at a frequency of approximately 3 cycles per second. The frequency was steadily increased until the package left the platform. The resonant frequency was achieved when a 1/16-inch-thick feeler gage momentarily slid freely between every point on the specimen in contact with the platform at some instance during the cycle or a platform acceleration achieved 1 ± 0.1 Gs. Midway into the testing period, the specimen was rotated 90 degrees and the test continued for the duration. Unless failure occurred, the total time of vibration was two hours if the specimen was tested in one position and three hours for more than one position.

C. EDGEWISE ROTATIONAL DROP TEST. This test was conducted using the procedures of Method 5008, Federal Standard 101. The procedure for the edgewise rotational drop test is as follows: The specimen was placed on its skids with one end of the pallet supported on a beam 4-1/2 inches high. The height of the beam was increased if necessary to ensure that there was no support for the skids between the ends of the pallet when dropping took place, but was not high enough to cause the pallet to slide on the supports when the dropped end was raised for the drops. The unsupported end of the pallet was then raised and allowed to fall freely to the concrete, pavement, or similar underlying surface from a prescribed height. Unless otherwise specified, the height of drop for level A protection conforms to the following tabulation:

GROSS WEIGHT NOT EXCEEDING (Pounds)	DIMENSIONS ON ANY EDGE NOT EXCEEDING (Inches)	HEIGHT OF DROP LEVEL A PROTECTION (Inches)
600	72	36
3,000	no limit	24
no limit	no limit	12

D. INCLINE-IMPACT TEST. This test was conducted by using the procedure of Method 5023, Incline-Impact Test of Federal Standard 101. The procedure for the Incline-Impact Test is as follows: The specimen was placed on the carriage with the surface or edge which is to be impacted projecting at least 2 inches beyond the front end of the carriage. The carriage was brought to a predetermined position on the incline and released. If it is desired to concentrate the impact on any particular position on the container, a 4- by 4-inch timber was attached to the bumper in the desired position before the test. No part of the timber was struck by the carriage. The position of the container on the carriage and the sequence in which surfaces

and edges are subjected to impacts was at the option of the testing activity and depends upon the objective of the tests. This test is to determine satisfactory requirements for a container or pack, and, unless otherwise specified, the specimen was subjected to one impact on each surface that has each dimension less than 9.5 feet. Unless otherwise specified, the velocity at time of impact was 7 feet per second.

PART 4

TEST EQUIPMENT

A. PALLETIZED UNIT LOAD (Test Sample).

- | | |
|--------------------------------|----------------|
| 1. Drawing Number: | 19-48-4042A/22 |
| 2. Pallet Supplier: | Olin Ordnance |
| 3. Width: | 38 inches |
| 4. Length: | 47-3/4 inches |
| 5. Height: | 36-1/4 inches |
| 6. Weight Loaded: | 1,400 pounds |
| 7. Quantity (PA103 Container): | 24 containers |

B. COMPRESSION TESTER.

- | | |
|-----------------------|------------------------|
| 1. Manufacturer: | Ormond Manufacturing |
| 2. Platform: | 60 inches by 60 inches |
| 3. Compression Limit: | 50,000 pounds |
| 4. Tension Limit: | 50,000 pounds |

C. TRANSPORTATION SIMULATOR.

- | | |
|------------------|--------------------|
| 1. Manufacturer: | Gaynes Laboratory |
| 2. Capacity: | 6,000-pound pallet |
| 3. Displacement: | 1/2-inch amplitude |
| 4. Speed: | 50 to 400 rpm |
| 5. Platform: | 5- by 8-foot |

D. INCLINE-IMPACT PLANE.

- | | |
|------------------|--------------------|
| 1. Manufacturer: | Conbur Incline |
| 2. Type: | Impact Tester |
| 3. Grade: | 10 percent incline |
| 4. Length: | 12-foot |

PART 5

TEST RESULTS

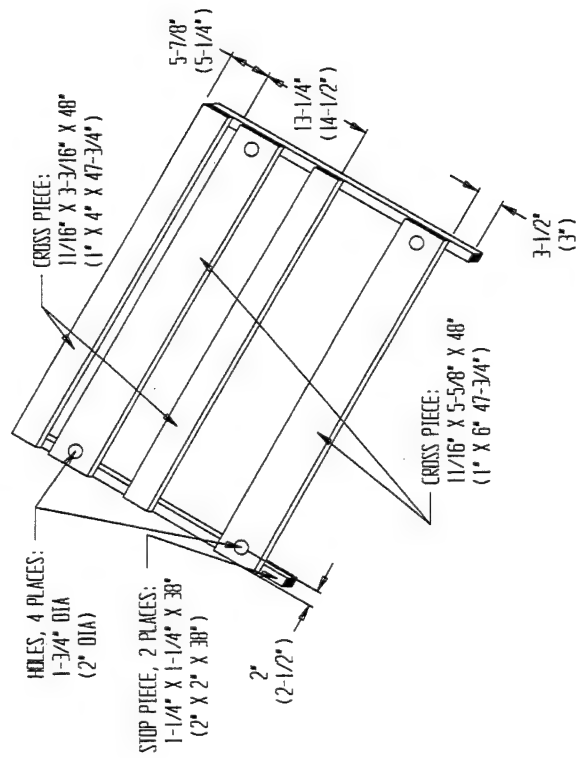
TEST OBSERVATIONS. The dimensions of the dunnage assemblies tested differ from those specified in drawing 4042A/22. Figure 1 displays these differences. The improper spacing of the cross pieces of the top, intermediate, and bottom dunnage assemblies allows the containers to move longitudinally, contributing to the containers becoming misaligned during testing. The strapping slots in the deck boards of the pallet are also improperly positioned. The strapping slots do not align with the circular cutouts for banding of the top dunnage assembly; therefore, the banding was run under the stringer boards, exposing it to possible damage from forklift tines (see photo on page 6-2).

Several components of the dunnage assemblies were damaged upon arrival, prior to any testing. One stop piece of the top dunnage assembly had a crack in it that eventually led to the stop piece breaking. Cracks across the grain of the wood also existed in the outside cross pieces of the top dunnage assembly. The cross pieces containing the circle cutouts to allow the 1-1/4-inch steel banding to run through were split from the edge of the circle to the end of the cross piece (see photo on page 6-5). The intermediate dunnage assembly has a cross piece that has split through the nail hole and a stop piece that is warped. The pallet dunnage assembly also has some splitting that occurred in cross pieces through nail holes.

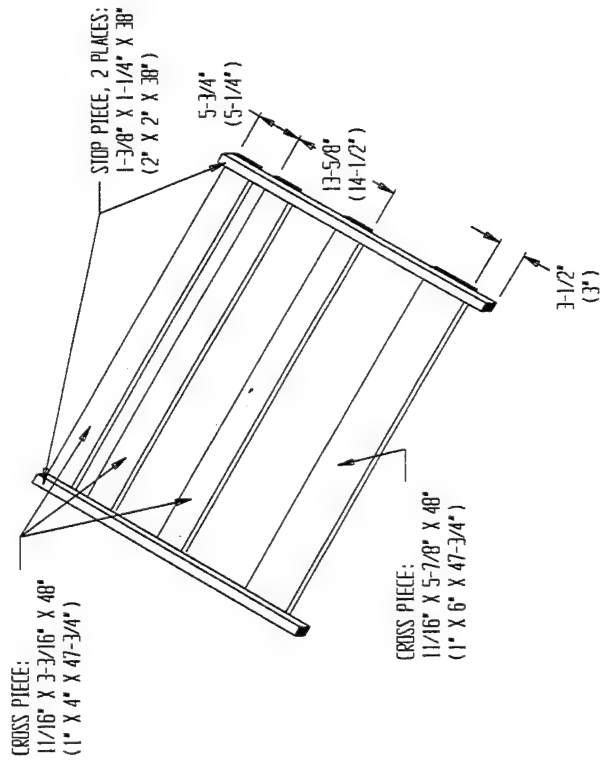
A. STACKING TEST. The test pallet was initially loaded to 7,500 pounds compression. The compression was released after one hour. No damage was noted during this test.

B. REPETITIVE SHOCK TEST. The duration of the test was 90 minutes for each orientation of the pallet. For the longitudinal orientation, the transportation simulator was set to 125 rpm. The vibration caused one end of a cross piece of the top dunnage assembly to come loose (see

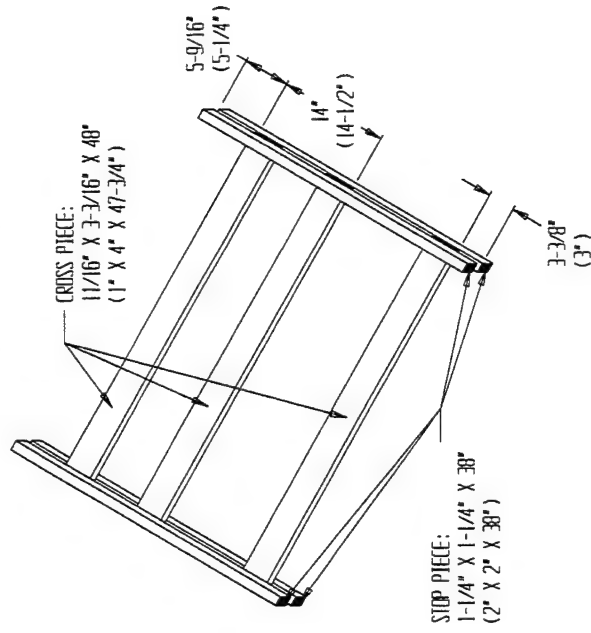
TOP DUNNAGE ASSEMBLY



PALLET DUNNAGE ASSEMBLY



INTERMEDIATE DUNNAGE ASSEMBLY



NOTES:

1. The stated dimensions are the dimensions of the test sample.
2. The dimension in parenthesis are the dimensions specified in Drawing 4042A/22.

FIGURE 1

photo on page 6-3). The transportation simulator was set for 183 rpm with the pallet in lateral orientation. The lateral vibration caused the containers to become misaligned. The misalignment was minor enough that the flanges of each column of containers were still in contact with the flanges of each adjacent column.

C. EDGEWISE ROTATIONAL DROP TEST. Each side of the pallet was placed on a beam displacing it 4-1/2 inches above the floor. The opposite end of the pallet was raised to a height of 24 inches, then dropped. The first drop resulted in the end of the cross piece of the top previously loose dunnage assembly to separate completely. The second drop caused one column of containers to become misaligned further. The misalignment caused the flanges of the containers of one column to make contact with the side of the cylindrical body of the containers in the adjacent column (see photo on page 6-5).

D. INCLINE-IMPACT TEST. The inclined-impact plane was set to allow the pallet to travel 8 feet prior to impacting a stationary wall. The pallet was rotated after each impact, until all four sides had been tested. While maneuvering the pallet into position, a sling caused another board of the top dunnage assembly to come loose. The third impact caused one container to become unnested (see photo on page 6-6). This container returned to the nested position during the fourth impact. The space between the intermediate dunnage assembly stop piece and the container sides reached 2 inches (see photo on page 6-4). Also, one stop piece of the top assembly was broken while moving the pallet following the fourth impact (see photo on page 6-5).

E. END OF TEST INSPECTION. The removal of the top dunnage assembly resulted in one of the stop pieces breaking at the location where a crack existed prior to testing (see photos on pages 6-7 and 6-11). Prior to removal, the containers were numbered with the corresponding positions shown in Figure 2. The majority of the containers had the paint on the top of the

flanges and the bell rubbed off. The top of container number 1 had paint removed by the load strap that made contact with the container during testing. The top of container number 14 was dented. The dent was located where the cross piece of the intermediate dunnage assembly rested on the container, approximately 2 inches in from the outside flange. The rest of the containers in that row had paint removed from being in contact with cross pieces of an intermediate dunnage assembly that is able to move in relation to the containers (see photo on page 6-8). Also, forklift tines caused minor damage to the stop piece of the pallet dunnage assembly (see photo on page 6-10).

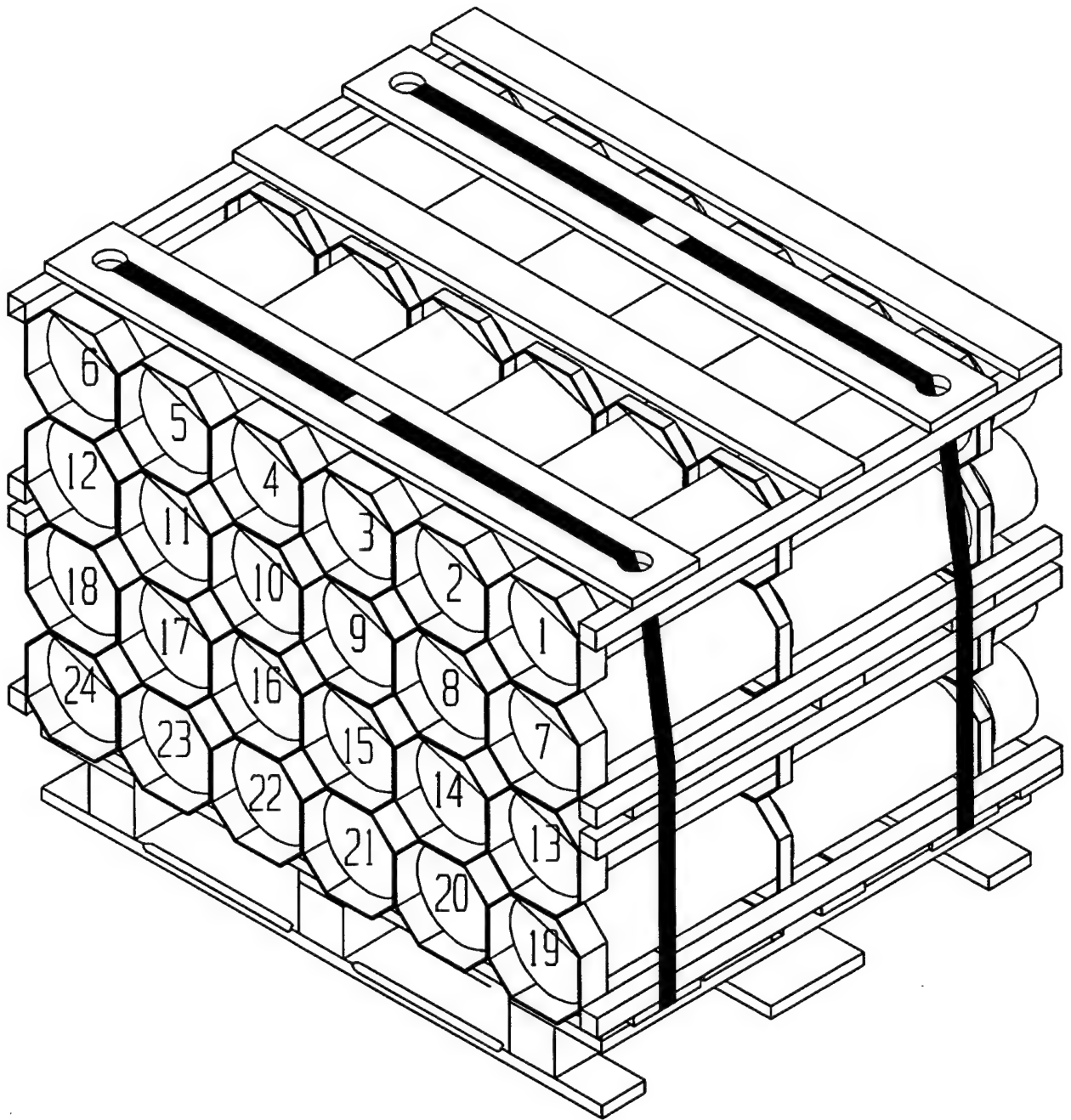
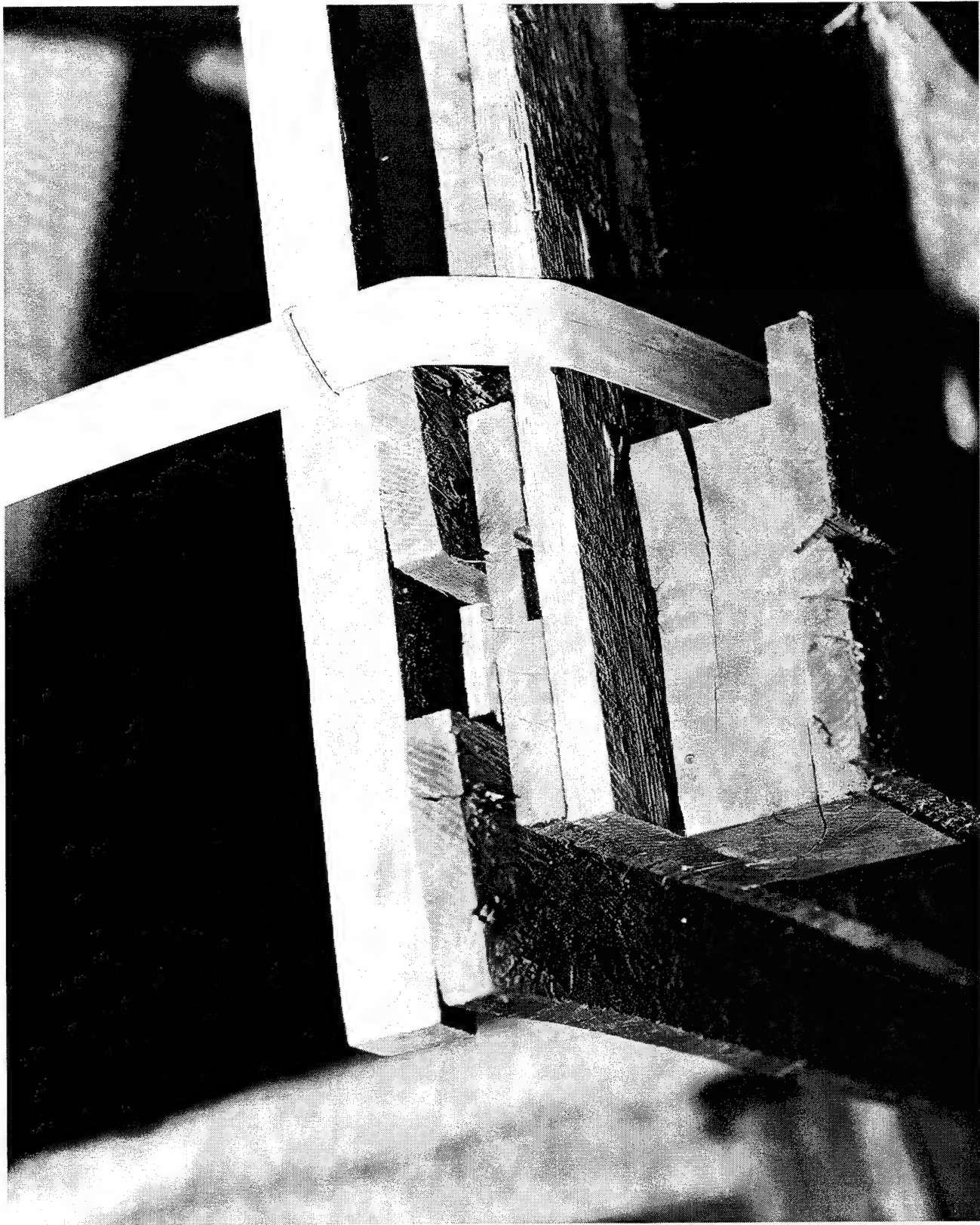


FIGURE 2

PART 6

PHOTOGRAPHS



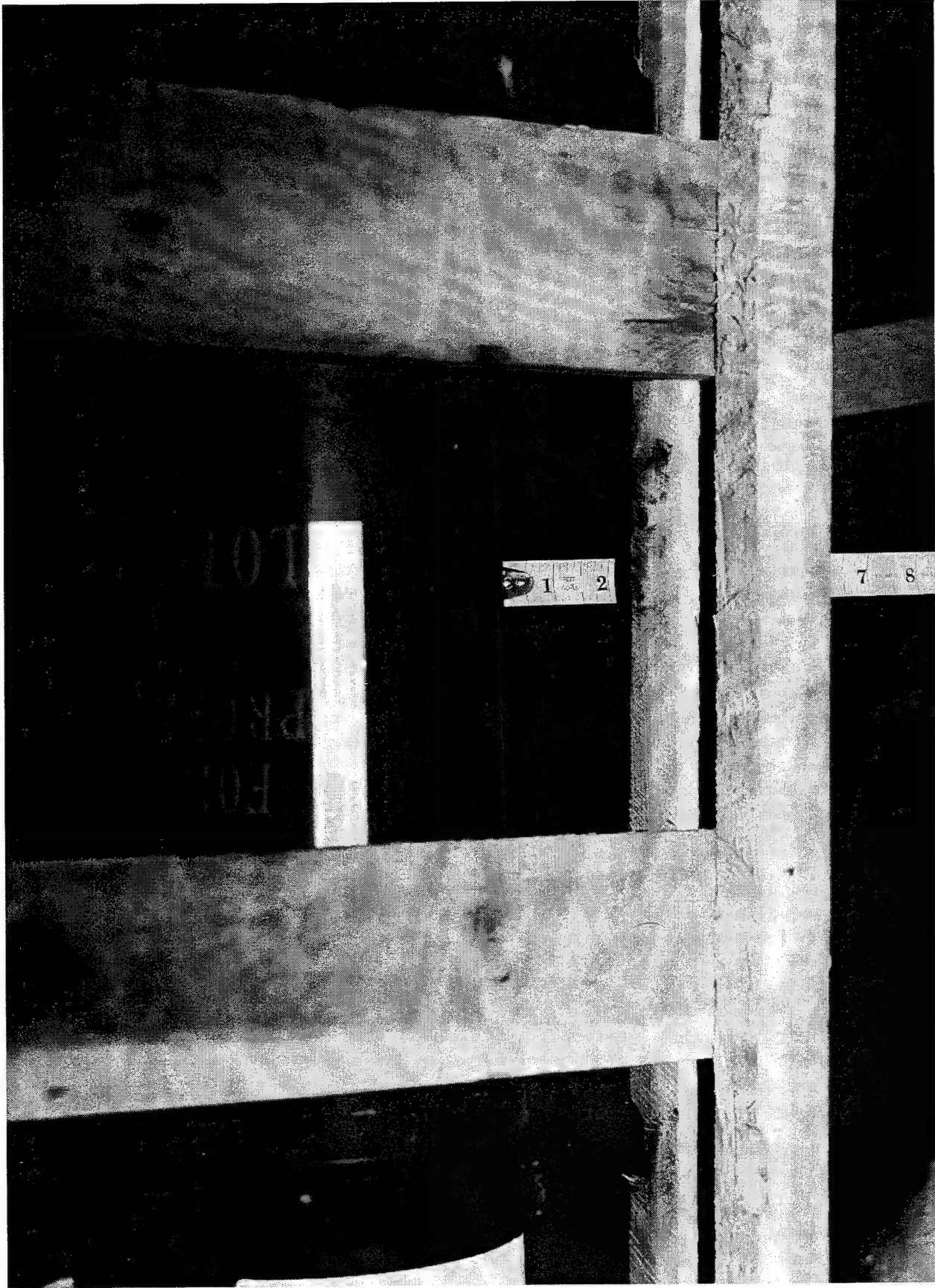
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL -
SAVANNA, IL

AO317-SCN96-57-1100. This photo shows 1-1/4-inch banding running under the stringer boards. Note the location of the strapping slot in the deck board.

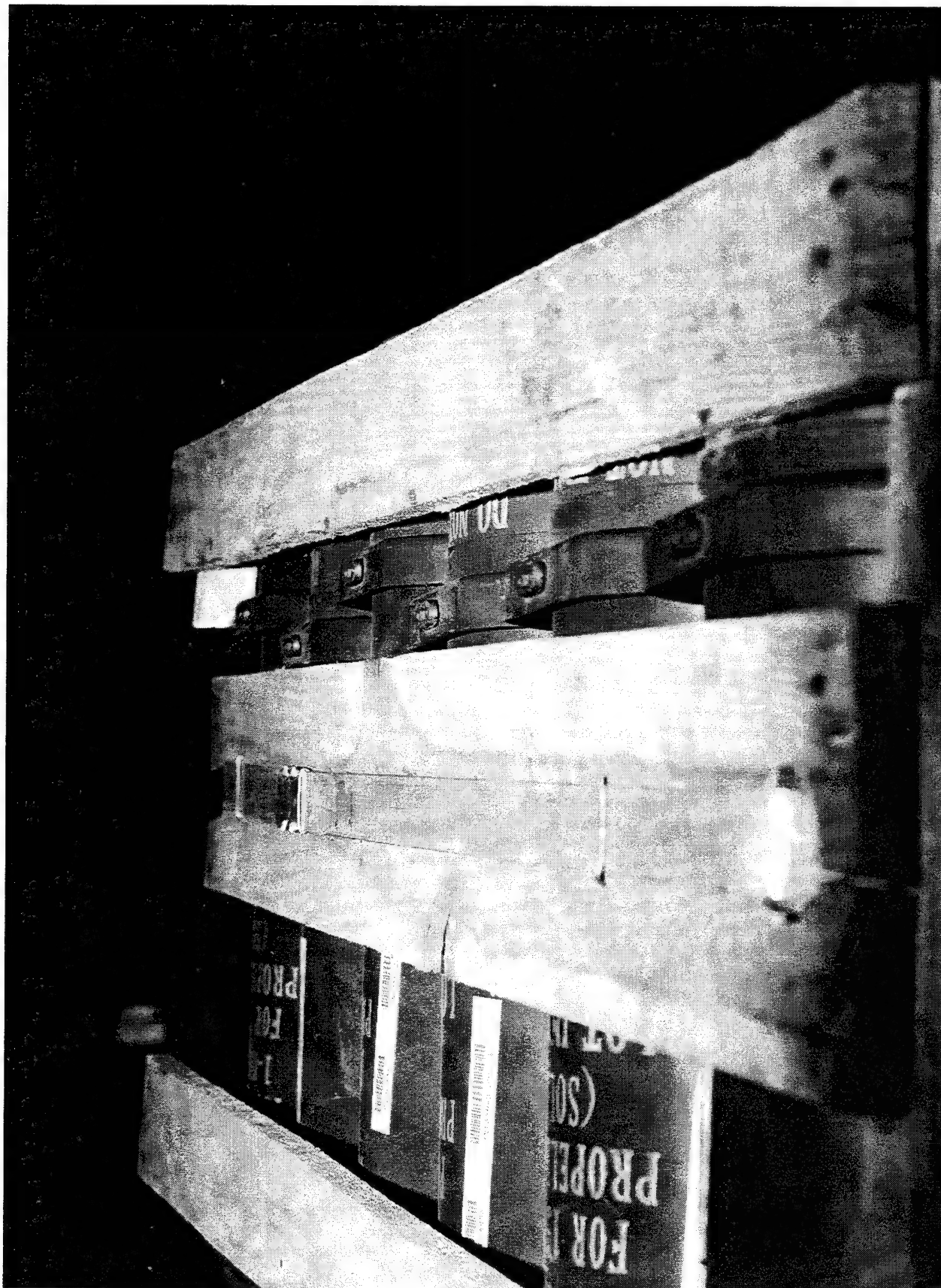


U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL -
SAVANNA, IL

AO317-SCN96-57-1111. This photo shows the unitized load. Note the loose cross-pieces of the top dunnage assembly and the broken stop piece.



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
AO317-SCN96-57-1105. This photo shows the space that exists between the stop pieces of the intermediate dunnage assembly and the containers. Note the indentation of the stop pieces of the intermediate dunnage caused by the flange on the containers.		



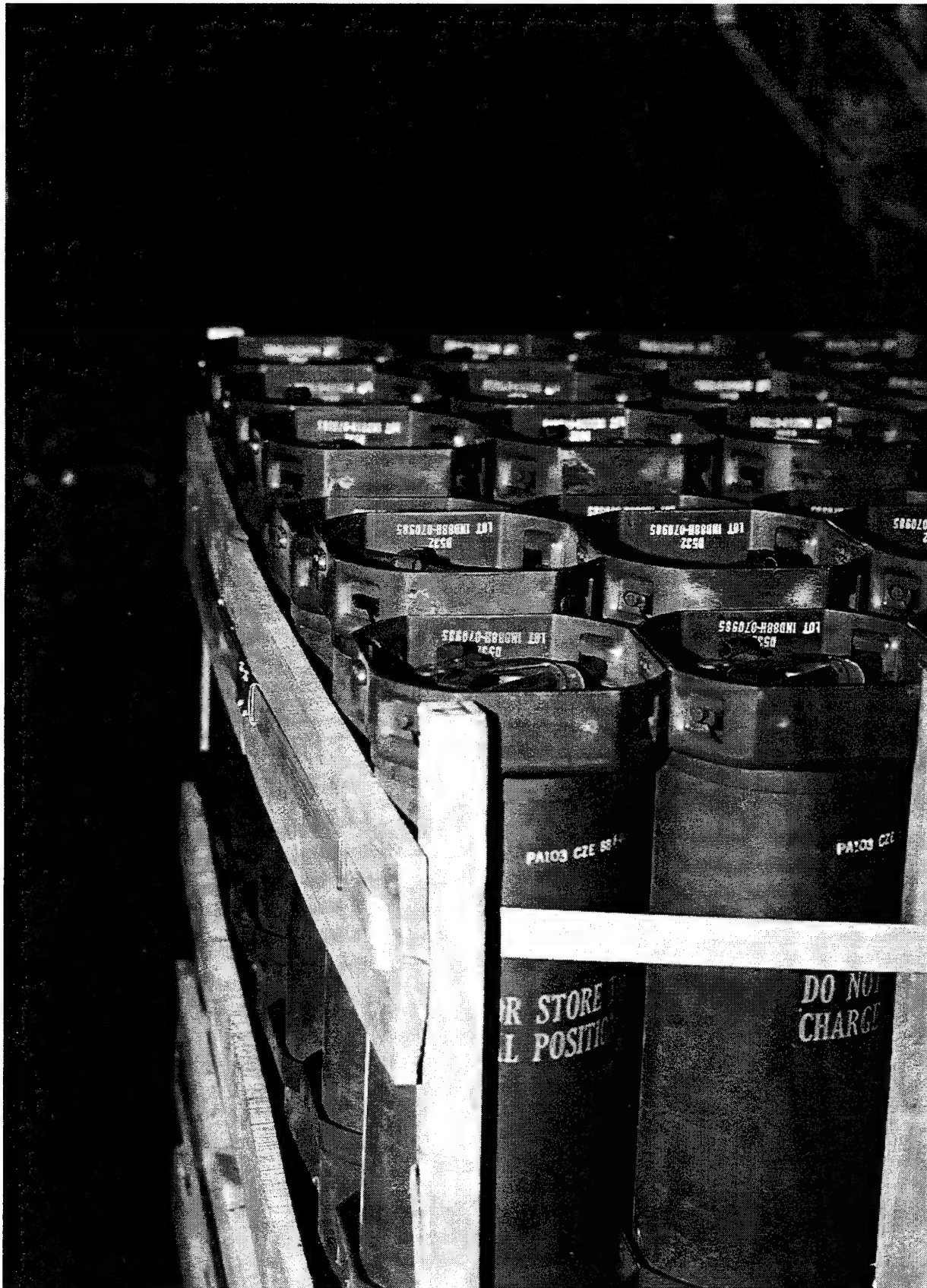
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL -
SAVANNA, IL

AO317-SCN96-57-1116. This photo shows the misaligned containers. Note the cracks in the cross pieces at the end of the circular cutout and at the nails.

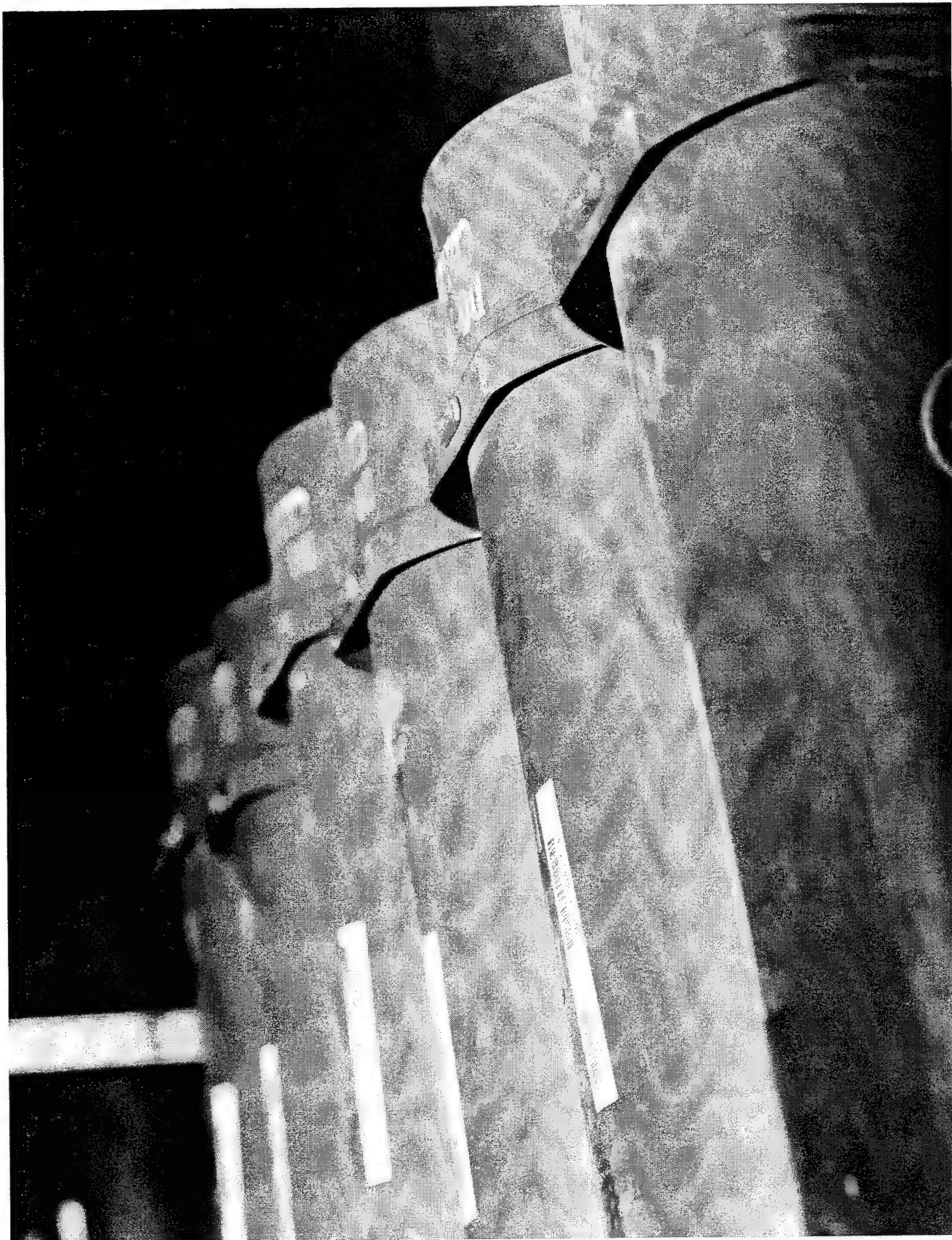


U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL -
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USADACS-DEV-96-15-01. This photo shows a container in the untested position. This photo was taken following the third impact of the incline-impact test.



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
AO317-SCN96-57-1118. This photo shows the crack in the stop piece of the top dunnage assembly that broke. Note the misaligned containers and the worn off paint on the bell of the containers.		

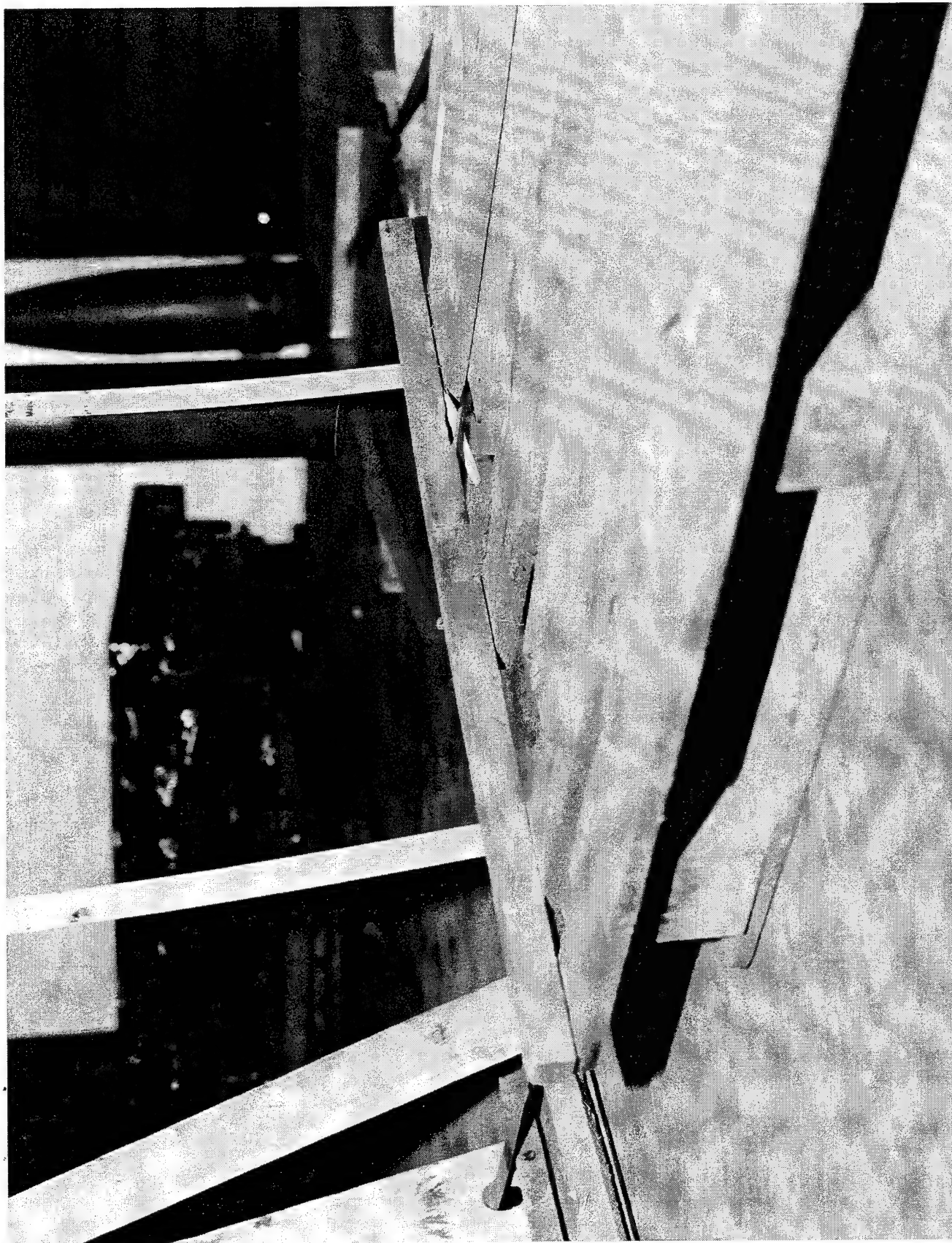


	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
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	AO317-SCN96-57-1108. This photo shows the second row of containers from the bottom. Note the paint worn off where the cross piece of the intermediate dunnage rests on the containers.	
--	--	--



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
AO317-SCN96-57-1110. This photo shows the bottom row of misaligned containers with the flange in contact with the cylindrical body of the adjacent container. Note the paint is removed from the top and side of the flanges.		



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
AO317-SCN96-57-1099.	This photo shows the stop piece of the pallet dunnage assembly damaged by a forklift tine.	



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
USADACS-DEV-96-15-02.	This photo shows the broken stop piece on the top dunnage assembly.	

PART 7

DRAWING

APPENDIX 22

UNITIZING PROCEDURES FOR PROPELLING CHARGES PACKED IN CYLINDRICAL METAL CONTAINERS ON 4-WAY ENTRY PALLETS

PAIO3 SERIES CONTAINER

INDEX

<u>ITEM</u>	<u>PAGE(S)</u>
GENERAL NOTES -----	2
UNIT DETAIL -----	4
DUNNAGE DETAILS -----	5
FILLERS AND INSTALLATION PROCEDURES FOR OMITTED CONTAINERS -----	6,7

PALLET UNIT DATA						
ITEMS INCLUDED		HAZARD CLASSIFICATION ^①				WEIGHT (LBS)
NSN	DODIC	DOT CLASS	CG CLASS	QD CLASS	COMP GROUP	
1320-01-202-8938	D532	B	II-A	1.3	C	1,370

NOTICE: THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4042A-20PM100L.

- ① HAZARD CLASSIFICATION DATA CONTAINED IN THE ABOVE CHART IS FOR GUIDANCE AND INFORMATIONAL PURPOSES ONLY. VERIFICATION OF THE SPECIFIED DATA SHOULD BE MADE BY CONSULTING THE MOST RECENT JOINT HAZARD CLASSIFICATION SYSTEM LISTING OR OTHER APPROVED LISTING(S).

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2	OCT 87	WRF WRF	William F Ernst William F Ernst	rh	rh	rh	rh
3	SEP 89	WRF WRF	William F Ernst William F Ernst	rh	rh	rh	rh
				U.S. ARMY DARCOM DRAWING			
				OCTOBER 1983			
				CLASS	DIVISION	DRAWING	FILE
				19	48	4042A/22	20PM 1001

DO NOT SCALE

GENERAL NOTES

- A. THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNITIZING PROCEDURES DRAWING 19-48-4042A-20PM1001. TO PRODUCE AN APPROVED UNIT LOAD, ALL PERTINENT PROCEDURES, SPECIFICATIONS AND CRITERIA SET FORTH WITHIN THE BASIC DRAWING WILL APPLY TO THE PROCEDURES DELINEATED IN THIS APPENDIX. ANY EXCEPTIONS TO THE BASIC PROCEDURES ARE SPECIFIED IN THIS APPENDIX.
- B. DIMENSIONS, CUBE AND WEIGHT OF A PALLET UNIT WILL VARY SLIGHTLY DEPENDING UPON THE ACTUAL DIMENSIONS OF THE CONTAINER, WEIGHT OF THE SPECIFIC ITEM, AND METHOD OF UNITIZATION.
- C. FOR OUTLOADING AND STORAGE OF THE ITEMS COVERED BY THIS APPENDIX, SEE DARCOM DRAWING 19-48-4042-1-2-5-11-14PM1000, REV NO. 1 (WILL BE SUPERSEDED BY ANOTHER 19-48 SERIES DARCOM DRAWING SPECIFICALLY FOR THE PA103 SERIES CONTAINER).
- D. FOR METHOD OF SECURING A STRAP CUTTER TO THE PALLET UNIT, SEE AMC (DARCOM) DRAWING 19-48-4127-20P1000.
- E. IF ITEMS COVERED HEREIN ARE UNITIZED PRIOR TO ISSUANCE OF THIS APPENDIX, THE CONTAINERS NEED NOT BE REUNITIZED SOLELY TO CONFORM TO THIS APPENDIX.
- F. THE UNITIZATION PROCEDURES DEPICTED HEREIN MAY ALSO BE USED FOR UNITIZING PROPELLING CHARGES WHEN IDENTIFIED BY DIFFERENT NATIONAL STOCK NUMBERS (NSN) THAN THOSE SHOWN ON THE COVER PAGE, PROVIDED THE ITEM IS PACKED IN THE PA103 SERIES CONTAINER. THE EXPLOSIVE CLASSIFICATION OF OTHER ITEMS MAY BE DIFFERENT THAN THOSE SHOWN.
- G. FOR DETAILS OF THE PA103 SERIES CONTAINER, SEE US ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER, DRAWING NO. 9349398.
CONTAINER DIMENSIONS----- 38" LONG BY 7-1/2" WIDE BY 7-1/2" HIGH.
CONTAINER CUBE ----- 1.24 CUBIC FEET.
CONTAINER WEIGHT (WITH CHARGE)----- 54 LBS (APPROX).
- H. IF DEEMED MORE ECONOMICAL FOR SHIPPING AND STORAGE BY THE RESPONSIBLE COMMAND, THE UNIT DEPICTED ON THE FOLLOWING PAGES MAY BE INCREASED BY ONE OR TWO COMPLETE LAYERS OF CONTAINERS. FOR FURTHER UNITIZATION GUIDANCE, SEE SPECIAL NOTE 3 ON PAGE 4.
- J. THE STYLE 1A PALLET DELINEATED IN THE VIEW ON PAGE 4 NEED NOT HAVE CHAMFERS OR STRAP SLOTS AS SPECIFIED WITHIN MILITARY SPECIFICATION MIL-P-15011 WHEN USED FOR THE UNITIZATION OF THE ITEMS COVERED BY THIS APPENDIX.

REVISIONS

REVISION NO. 1, DATED OCTOBER 1985, CONSISTS OF:

1. ADDING ITEM BY NATIONAL STOCK NUMBER TO PALLET UNIT DATA CHART.
2. CHANGING UNIT WEIGHT.

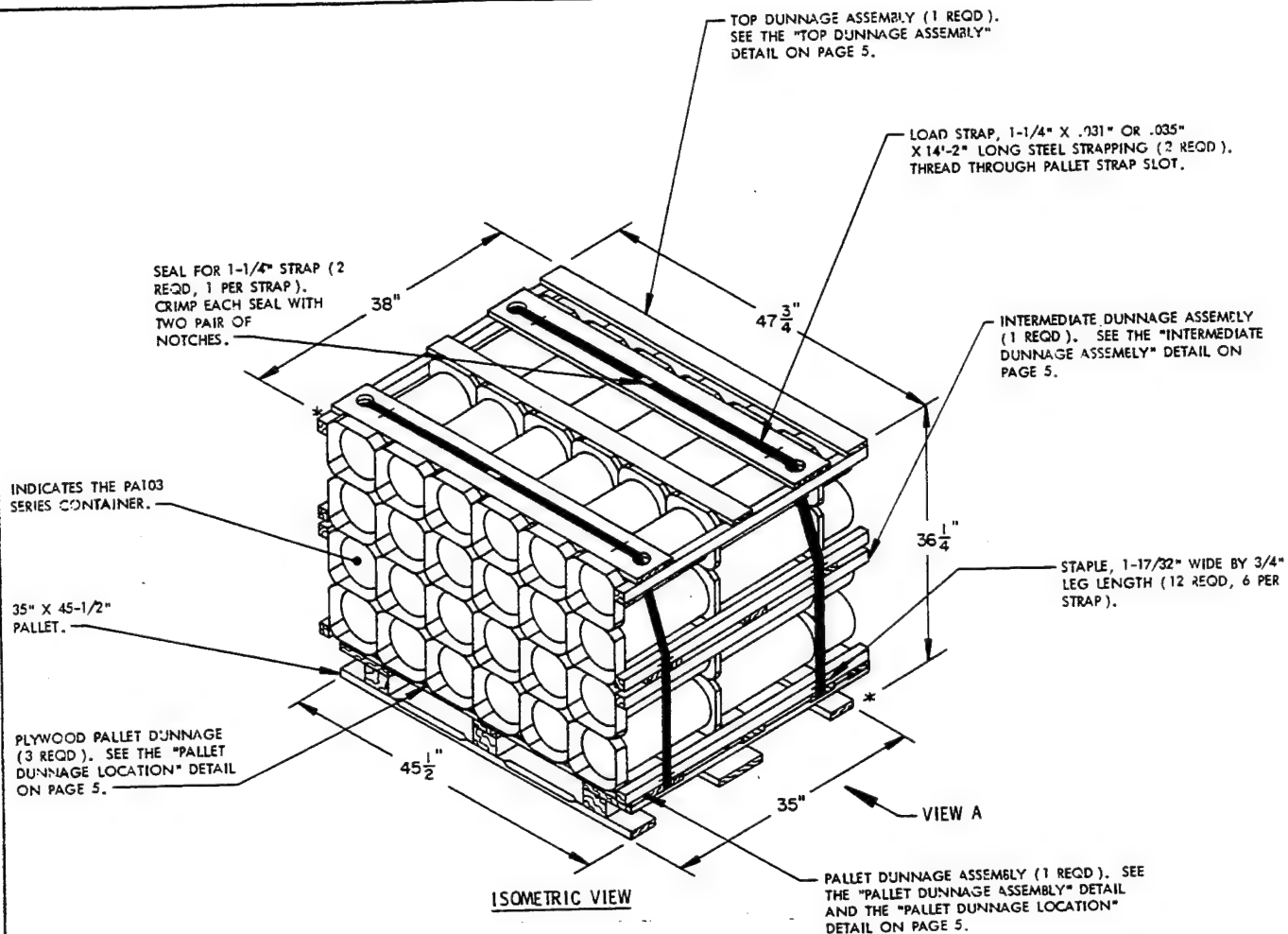
REVISION NO. 2, DATED OCTOBER 1987, CONSISTS OF:

1. ADDING ITEM BY NATIONAL STOCK NUMBER TO PALLET UNIT DATA CHART.
2. ADDING DATA TO PALLET UNIT DATA CHART.

REVISION NO. 3, DATED SEPTEMBER 1989, CONSISTS OF:

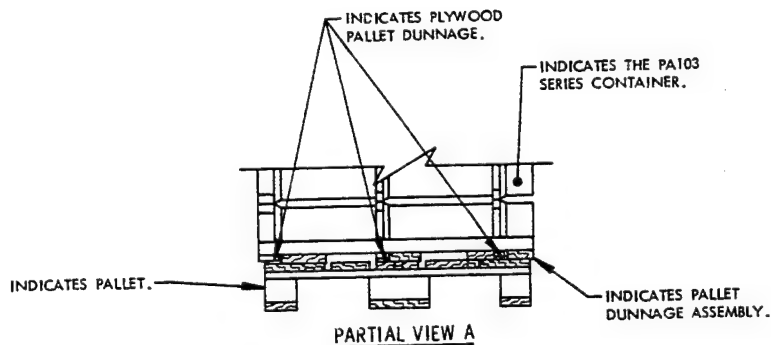
1. DECREASING PALLET UNIT BY TWO LAYERS OF CONTAINERS.
2. DELETING ITEM BY NATIONAL STOCK NUMBER FROM PALLET UNIT DATA CHART.
3. CHANGING WEIGHT FOR NSN IN PALLET UNIT DATA CHART.
4. CHANGING SPECIAL NOTE 3 AND DELETING SPECIAL NOTE 4.

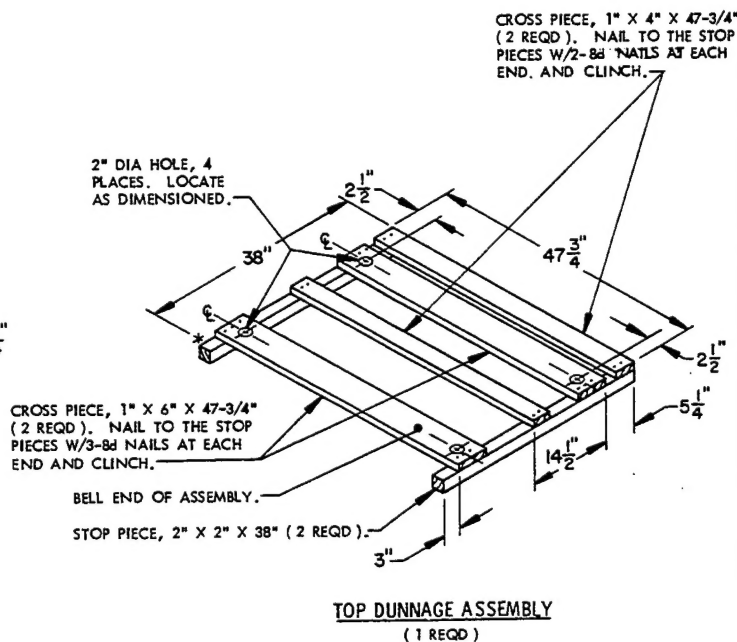
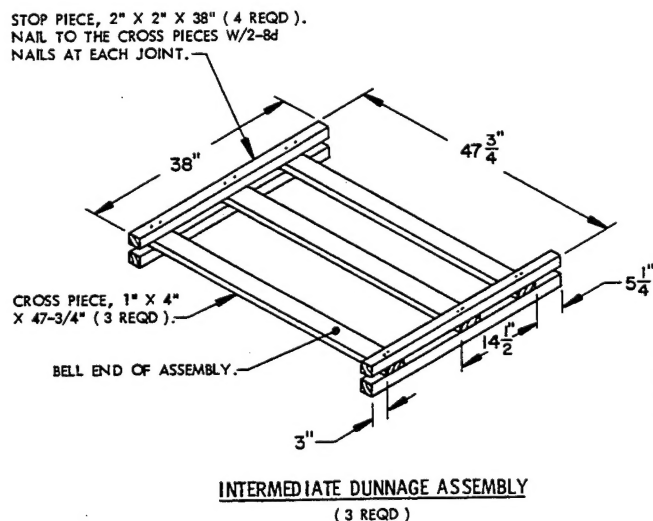
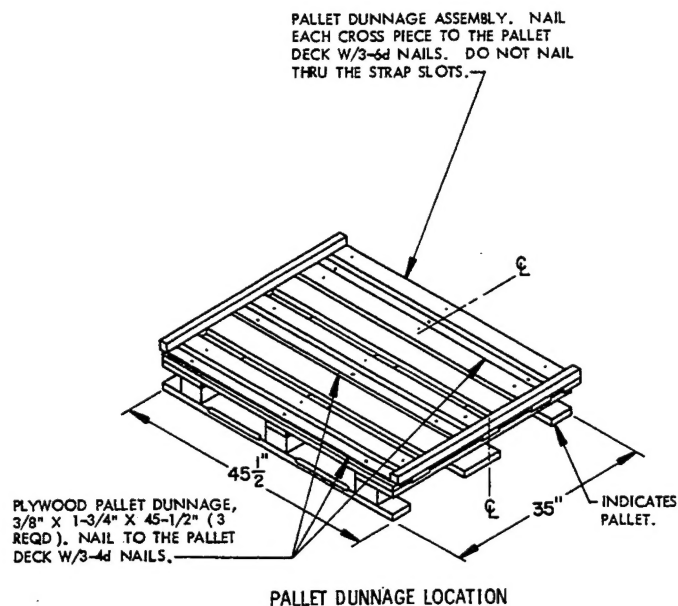
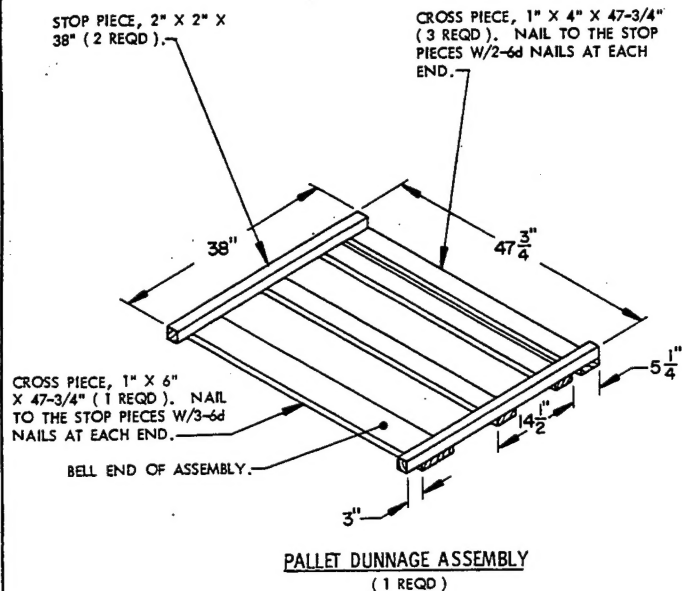
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SPECIAL NOTES:

1. DIMENSIONS GIVEN FOR DUNNAGE PIECES OR DUNNAGE ASSEMBLIES WILL BE FIELD CHECKED PRIOR TO THEIR ASSEMBLY TO THE PALLET UNIT. CONTAINERS MUST FIT SNUGLY IN THE DUNNAGE ASSEMBLIES. ALSO, DUE TO THE VARIATION OF CONTAINER DIMENSIONS, ADJUSTMENTS MAY BE REQUIRED AS TO THE LOCATION OF CERTAIN PIECES OF DUNNAGE IN A DUNNAGE ASSEMBLY.
2. ALTHOUGH THE PROPELLING CHARGE CONTAINERS DEPICTED IN THE UNIT LOAD ABOVE ARE CONSTRUCTED WITH INTERLOCKING DEVICES, THE INTERLOCKS WILL NOT FUNCTION PROPERLY UNLESS THE CONTAINERS ARE POSITIONED SO THAT THE "PINS" OF THE INTERLOCKS ARE IN AN UPRIGHT ORIENTATION. THIS ORIENTATION WILL PRECLUDE INTERFERENCE OF THE "PINS" AND THE PLYWOOD PALLET DUNNAGE AND WILL AID IN THE PREVENTION OF CONTAINER MOVEMENT, BOTH Laterally AND LONGITUDINALLY, DURING SHIPMENT OF THE UNIT LOAD.
3. THE UNIT LOAD DEPICTED ABOVE MAY BE INCREASED BY ONE OR TWO LAYERS WHEN DEEMED ADVANTAGEOUS FOR A CERTAIN MODE OF TRANSPORTATION. IN THIS EVENT, A SECOND "INTERMEDIATE DUNNAGE ASSEMBLY" MUST BE ADDED AND THE LOAD STRAP LENGTHS MUST BE INCREASED. THE DECISION TO INCREASE THE LOAD BY ONE OR TWO LAYERS WILL BE MADE BY THE RESPONSIBLE COMMAND AND WILL BE BASED ON THE ECONOMICS OF TRANSPORTATION AND HANDLING.





BILL OF MATERIAL			
LUMBER	NO. REQD	LINEAR FEET	BOARD FEET
1" X 4" X 47-3/4"	8	31.63	10.61
1" X 6" X 47-3/4"	3	11.94	5.97
2" X 2" X 38"	8	25.33	8.44
NAILS	NO. REQD	POUNDS	
4d (1-1/2")	9	0.03	
6d (2")	30	0.18	
8d (2-1/2")	44	0.46	
PALLET, 35" X 45-1/2" — 1 REQD — 65 LBS			
STEEL STRAPPING, 1-1/4" X .031" OR .035" — 28.33' REQD — 4.05 LBS			
SEAL FOR 1-1/4" STRAPPING — 2 REQD — NIL			
STAPLE, 1-17/32" X 3/4" — 12 REQD — NIL			
PLYWOOD, 3/8" — 1.66 SQ FT REQD — 1.71 LBS			

UNIT DATA

WEIGHT

CUBE — 38.1 CUBIC FEET (APPROX)
 CONTAINER, PA103 SERIES—24 EACH @ 52 LBS—1,248 LBS (APPROX)
 DUNNAGE — 57 LBS
 PALLET — 65 LBS

TOTAL WEIGHT — 1,370 LBS (APPROX)

SPECIAL NOTES:

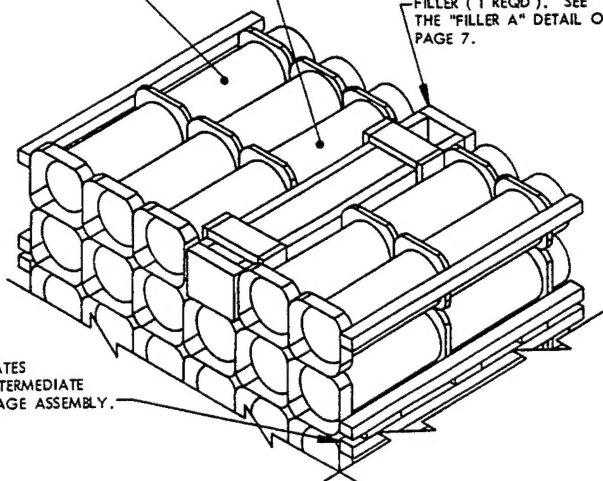
1. WHEN SIX CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, A COMPLETE LAYER OF CONTAINERS MUST BE OMITTED. WHEN FIVE CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, A COMBINATION OF FILLER ASSEMBLIES DEPICTED ON PAGE 7 MUST BE USED. WHEN FOUR OR LESS CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, A COMBINATION OR ONE OF THE FILLER ASSEMBLIES DEPICTED ON PAGE 7 MAY BE USED. ALL FILLER ASSEMBLIES MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OR LAYERS OF A PALLET UNIT.
2. THE OVERALL HEIGHT OF THE FILLER ASSEMBLIES DEPICTED ON PAGE 7 MUST BE REDUCED FROM 7-1/4" TO 6-1/2" WHEN INSTALLED BETWEEN A TOP DUNNAGE ASSEMBLY AND AN INTERMEDIATE DUNNAGE ASSEMBLY OR BETWEEN ANOTHER FILLER ASSEMBLY AND AN INTERMEDIATE DUNNAGE ASSEMBLY.

INDICATES THE PA103 SERIES CONTAINER.

THE TOP DUNNAGE ASSEMBLY AND STRAPPING HAVE BEEN OMITTED FOR CLARITY PURPOSES.

FILLER (1 REQD.). SEE THE "FILLER A" DETAIL ON PAGE 7.

INDICATES AN INTERMEDIATE DUNNAGE ASSEMBLY.



DETAIL A

THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD PALLET UNIT MINUS ONE CONTAINER IS TO BE UNITIZED. THE FILLER ASSEMBLY DEPICTED MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OF THE PALLET UNIT.

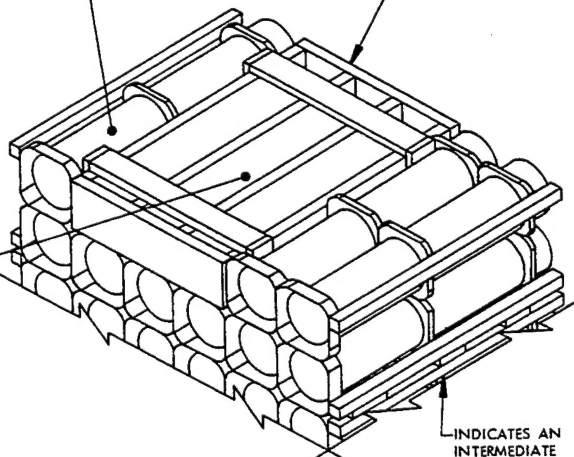
INDICATES THE PA103 SERIES CONTAINER.

FILLER (1 REQD.). SEE THE "FILLER C" DETAIL ON PAGE 7.

THE TOP DUNNAGE ASSEMBLY AND STRAPPING HAVE BEEN OMITTED FOR CLARITY PURPOSES.

FILLER (1 REQD.). SEE THE "FILLER D" DETAIL ON PAGE 7.

INDICATES THE PA103 SERIES CONTAINER.



INDICATES AN INTERMEDIATE DUNNAGE ASSEMBLY.

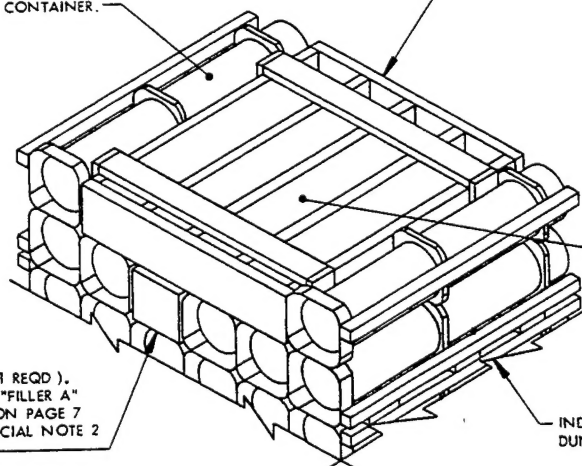
DETAIL B

THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD PALLET UNIT MINUS THREE CONTAINERS IS TO BE UNITIZED. THE FILLER ASSEMBLY MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OF THE PALLET UNIT.

FILLER (1 REQD.). SEE THE "FILLER A" DETAIL ON PAGE 7 AND SPECIAL NOTE 2 ABOVE.

THE TOP DUNNAGE ASSEMBLY AND STRAPPING HAVE BEEN OMITTED FOR CLARITY PURPOSES.

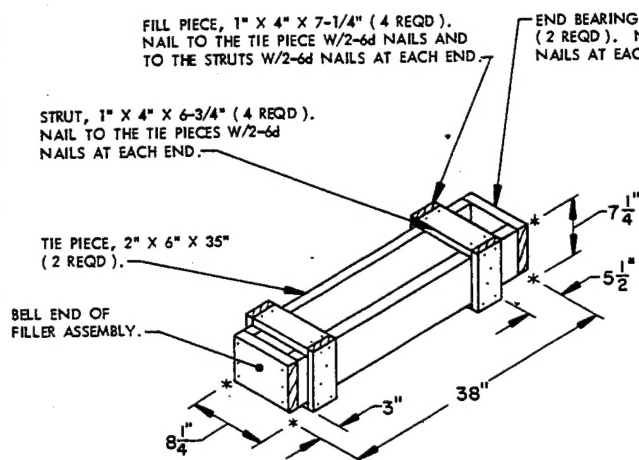
INDICATES AN INTERMEDIATE DUNNAGE ASSEMBLY.



DETAIL C

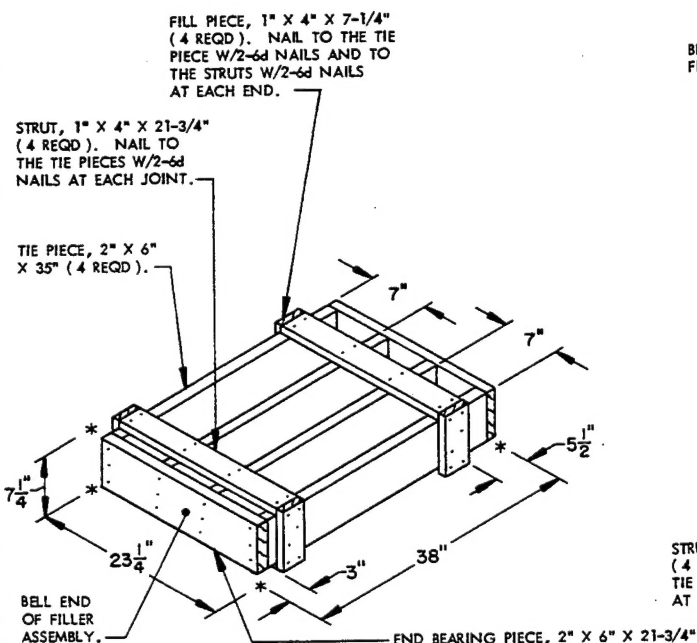
THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD PALLET UNIT MINUS FIVE CONTAINERS IS TO BE UNITIZED. THE FILLER ASSEMBLIES DEPICTED MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYERS OF THE PALLET UNIT.

FILLERS AND INSTALLATION PROCEDURES FOR OMITTED CONTAINERS



FILLER A

THIS FILLER ASSEMBLY IS TO BE USED WHEN ONE CONTAINER IS TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.



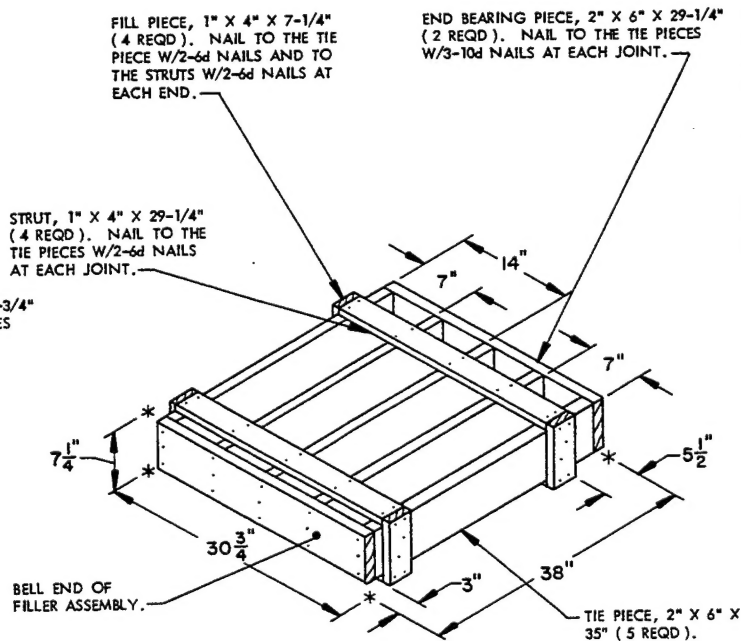
FILLER B

THIS FILLER ASSEMBLY IS TO BE USED WHEN TWO CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.



FILLER C

THIS FILLER ASSEMBLY IS TO BE USED WHEN THREE CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.



FILLER D

THIS FILLER ASSEMBLY IS TO BE USED WHEN FOUR CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.

